

Algebra I Readiness:

A Pathway to Student Success

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VISION & MISSION

The Arkansas Department of Education is transforming Arkansas to lead the nation in student-focused education.

The Arkansas Department of Education provides leadership, support, and service to schools, districts, and communities so every student graduates prepared for college, career, and community engagement.

MATH VISION

Arkansas' vision for math is to ensure all students **understand** concepts, **use** procedures efficiently, and **apply** math through problem-solving. This is achieved through grade-level instruction that empowers students to take an active role in learning and master essential numeracy skills.



- Focus on what you can control or influence
- Assume positive intent
- Value different perspectives
- Make space and listen to all voices
- Seek solutions, not problems
- Challenge and be open to be challenged
- Zoom In on the work and Zoom Out to the bigger picture

Who is in the room?



Session Expectations



Purpose and Objectives

Participants will:

- Investigate how key predecessor skills drive student success in Algebra I.
- Understand how key levers walk-through data connects to evidence of student learning.
- Refine systems to strengthen Algebra I Readiness across classrooms.

RESEARCH



Why is Algebra 1 Readiness so important?



The Gateway to Opportunity:

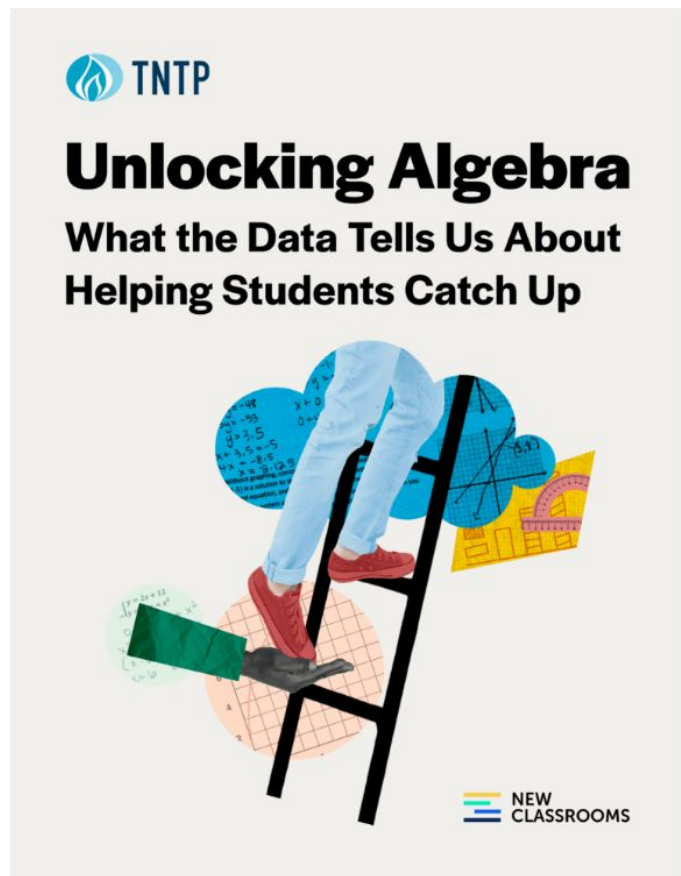
Students who pass Algebra I by ninth grade are:

Benefits:

- More likely to graduate high school
- Significantly more likely to attend college.
- Correlated with higher salaries in the workforce.



What does the research say?



Many students enter Algebra I with only about $\frac{1}{3}$ of **prerequisite skills**.

Students who:

- Build prerequisite skills **simultaneously with Algebra I** content perform better on state assessments.
- Started Algebra I with unfinished learning did **not need to cover every skill** and concept before learning new content.
- Focused on key skills worked on the **most advanced** algebra-related concept they are equipped to learn.

TNTP, *Unlocking Algebra* (2025)



“All else being equal, what specific prior knowledge makes a student most likely to succeed when learning a new Algebra I concept or skill?”

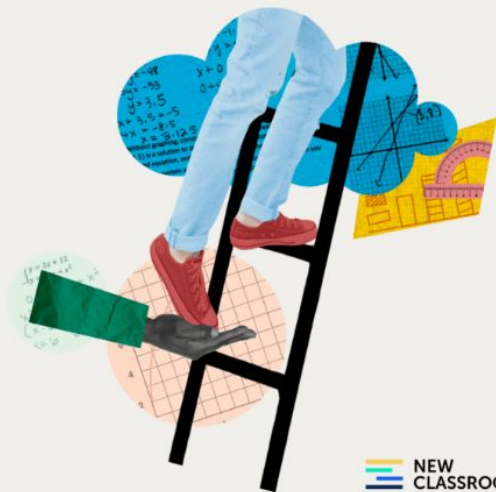
Researchers at TNTP asked a critical question





Unlocking Algebra

What the Data Tells Us About
Helping Students Catch Up



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Key Predecessors

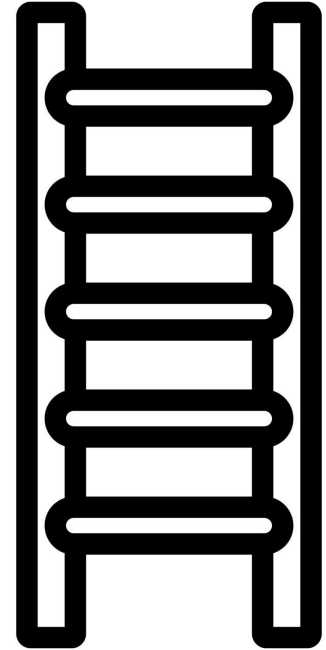
Key Predecessors are prerequisite skills that **most strongly predict success** with new learning in Algebra I.

Predecessors = Prerequisite Skills

Recap Research



- **Key predecessors** strongly predict student success on new Algebra I skills.
- **Key predecessors** are the foundation for Algebra I readiness.
- Students who learn **key predecessors** perform better on state assessments.



After the research and information, what shifts need to happen in your district or school?

SKILL PROGRESSION



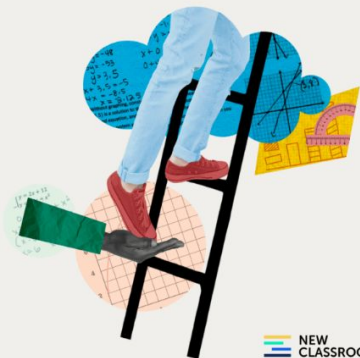


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What does vertical
alignment look like
for one skill?

Teach to One Roadmaps Algebra Ladder



Algebra Ladder

All concepts and skills related to Algebra
throughout a student's math education,
both in Algebra I and prior grades.

Algebra I	52
Grade 8	28
Grade 7	19
Grade 6	21
Grade 5	11
Grade 4	11
Pre-4	5

Algebra 1 Readiness (Middle School)



Middle school concepts that prepare students for Algebra 1:

- Coordinate Plane System and Linear Functions
- Number Types
 - Prime numbers
 - Factors
 - Positive and Negative Integers
 - Exponents
- Algebra
 - Expressions and Equations
- Proportional Relationships
 - Ratio

Teach to One Roadmaps Algebra Ladder

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Essential Skills Map - Solving Complex Equations



Major Concept

Solve Complex Equations

Solve Basic Equations



Skill

By Grade Level

Multi-step Equations

Two Step Equations



Focus Skill

Solve equations with variables on both sides

Solve one-step equations



Essential Skills Map - Solving Complex Equations



Focus Skill

Solve equations
with variables on
both sides



Skill Description



Standard



Prerequisite Skill



Key Predecessors

DATA COLLECTION



Shared Challenge



Teacher: Mr. Tarpley

Grade-Level: 8th

Jordan, an eighth-grade student, excels in solving multi-step equations but struggles with fractions as coefficients, applying the order of operations, and explaining her problem-solving process. Her teacher, Mr. Tarpley, acknowledges her strengths but is unsure how to address these challenges effectively and support her continued growth in math.

Observational Data

Targeting Foundational Math Skills Instruction: Grades 6-8 Key Levers for Instructional Leaders



DIVISION OF ELEMENTARY
& SECONDARY EDUCATION

5 Impact Areas:

- Structure for Learning
- Math Aligned Content
- Math Teacher Instructional Practices
- Student Practice
- Assessment & Differentiation

Rating:

- **Strong Evidence:** Most look-fors are observed with skillful application.
- **Partial Evidence:** Some look-fors are observed with skillful application.
- **Little Evidence:** Little evidence of look-fors are observed or inconsistent application.
- **No Evidence:** No evidence of look-fors are observed in application.

Impact Area	Indicators
Structure for Learning	1. Students are engaged in the work of the lesson from start to finish; there is a sense of urgency about how time is used. Look Fors: • Students participate in meaningful activities throughout the lesson. • Students volunteer responses and ask appropriate questions. • Routines and transitions require minimal teacher prompting or redirection. • The lesson is well-paced; the teacher works to maximize time spent on instructional activities aligned with the learning targets.
	Strong Evidence Partial Evidence Little Evidence No Evidence
Math Aligned Content	2. The teacher skillfully delivers grade-level appropriate lessons using district-adopted HQIM; lessons reflect grade-level standards. Look Fors: • The teacher skillfully uses the district-adopted curriculum, as appropriate, to teach the lesson. • The lesson is aligned within the scope and sequence, ensuring that students will engage with the full curriculum during the school year. • The objective of the lesson aligns with grade-level standards. ◦ Lesson modifications are made to strengthen the alignment to the state standards, as appropriate. • Students' work shows past and current foundational skills and connections made by the teacher and/or students to previously taught skills. • Teachers integrate curriculum-embedded strategies in alignment with the aspects of mathematical rigor (conceptual understanding, procedural fluency, and application).
	Strong Evidence Partial Evidence Little Evidence No Evidence
Math Instructional Practices	3. The lesson includes adequate opportunities for the teacher to employ instructional practices that allow students to take ownership of the content. Look Fors: • There is a clear articulation of the objective to students (stated verbally, written on student work, displayed visually, etc.). • The teacher uses purposeful questions and/or academic mathematical vocabulary during instruction. • The teacher guides student discussions to connect models, drawings, and equations (CRA) for understanding and problem-solving. • Teachers provide opportunities for students to use relationship strategies, properties of operations, and algorithms to compute. • The teacher enhances instruction by using visual aids and/or manipulatives (number lines, arrays, area models, anchor charts, graphic organizers, patty paper, algebra tiles, etc.).
	Strong Evidence Partial Evidence Little Evidence No Evidence
Student Practice	4. The lesson includes adequate time for students to practice targeted skills (i.e., proportional relationships, functions, algebraic relationships, or geometry). Look Fors: • The teacher provides adequate time for student practice. • There are adequate opportunities for students to practice targeted skills through reasoning, reflection, representation, and/or pattern relationships. • Students use representations (CRA) to describe their thinking with number concepts, proportional relationships, functions, and/or algebraic relationships mathematically or in a context. • Students use targeted skills to solve problems flexibly and accurately. • All practice authentic problem-solving by accurately modeling real-world situations.
	Strong Evidence Partial Evidence Little Evidence No Evidence
Assessment & Differentiation	5. The teacher collects and responds to student data to adjust instruction for all student(s). Look Fors: • The teacher checks for understanding throughout the lesson and applies strategies in response to student need(s). • A data collection system is in place (checklist, exit tickets, student interviews, and monitoring of student work, etc.). • The teacher provides on-the-spot feedback, correction, and confirmations of student answers. • There is small group instruction and/or differentiated tasks as appropriate.
	Strong Evidence Partial Evidence Little Evidence No Evidence



How can **observing** for foundational skills (key predecessors) improve teaching and learning?



Time	Teacher Actions	Student Actions
10:05	T: "Today we are solving multi-step equations with variables on both sides." T displays the problem: $\frac{2}{3}(x + 6) - 4 = \frac{1}{2}x + 8$ T: "Start by working independently."	• Students copy the objective and problem into notebooks. • 10 of 23 students begin writing steps independently.
10:06	T: "Remember, we can combine like terms and use inverse operations." T: starts walking around the room and looks at student work.	• 6 students multiply $\frac{2}{3}$ by x but do not multiply $\frac{2}{3}$ by 6. • 3 students write $\frac{2}{3} + 6$, 3 students write $\frac{3}{2} + 6$ • 1 student completed the example correctly and worked on the next problem. • 6 students watching others, not writing • 4 students head down • 3 students in back talking
10:07	T: Stops, asks one student who was watching, "What should we do next?" S: "Move the x ." T: "Yes, move the variables to one side." T: Redirected distracted students	• Students continue working • 2 students subtract $\frac{1}{2}x$ from only one side of the equation.
10:08	T: "Next we combine like terms." T writes: $\frac{2}{3}x + 4 - 4 = \frac{1}{2}x + 8$	• 16 students looking at the board. • 4 students erased work and copied the teacher's work from the board. • 3 students with heads down
10:09	T: "What do we do next?" S: "Subtract the x ." T: "Right. Subtract the $\frac{1}{2}x$."	• 5 Students subtract $\frac{1}{2}x$. • 3 students write $\frac{1}{5}x$ • 1 student writes $\frac{1}{6}x$.

Planning Data

Lesson Internalization

1. Read the entire lesson.
 - a. Identify the **2023 Arkansas Math Standards** that align with the lesson.
 - b. Determine the **key learning goals** and **prerequisite skills** students need.
 - c. Highlight any **representations, problem types, and strategies**.
 - d. Circle and define any new **vocabulary**.
2. Work the **student tasks** and the **exit ticket** from the student book to anticipate student thinking.
 - a. Jot down **possible misconceptions** or areas of struggle.
 - b. Identify and record the mastery expectations of each task.
3. Mark essential components "**must do**" with a ☆ and **time-stamp** the components.
 - e. Plan how to **check for understanding** throughout the lesson.
4. Identify opportunities for **engagement strategies** and add strategies when needed. (e.g., cold call, turn & talk, think, pair, and share, everyone writes, cooperative groups)
5. Recognize when **practice and explicit systematic instruction*** is needed to introduce new concepts, clarify misunderstandings, or support students struggling with key skills.
 - f. Plan **student practice** before or after the lesson, based on the learning goal and student needs.
6. Identify and explain all the materials **needed** for the lesson.

How can **planning** for foundational skills (key predecessors) improve teaching and learning?



Mathematics Lesson Internalization Protocol

1. Read the entire lesson.
 - a. Identify the **2023 Arkansas Math Standards** that align with the lesson.

8.ALG.1: Analyze and solve one-variable linear equations with rational coefficients containing solutions with one, zero, or infinitely many solutions.
 - b. Determine the **key learning goals** and **prerequisite skills** students need.
 - **Learning goal:** Students will solve multistep equations with variables on both sides.
 - **Prerequisite skills (Key Predecessors Highlighted):**
 - adding and subtracting fractions with unlike denominators
 - multiplying whole numbers and fractions
 - integer operations
 - creating zero pairs
 - solving 2 step equations
 - substitution

Follow Up Observational Data



Teacher: Mr. Tarpley

Grade-Level: 8th

Observation: Tier 1

Key Levers Impact Area: Math Aligned Content

Tool: Key Levers

During Tier 1 instruction, what might you hear and see during a walk-through?

Hear	See
Teachers cue students to recall prior key predecessors before beginning a task.	Teachers use representations to make the predecessor skill visible.
Teachers guide student discourse so that students connect key predecessors to grade level content.	Teachers explicitly connects how the key predecessors relate to representations in grade level content.
Students referring to key predecessors in their explanations.	Student work shows active use of key predecessor skills.
Students reference key predecessors during language routines (e.g. turn and talk) to justify, explain, or make sense of a grade-level idea.	Students use strategies connected to key predecessor skills (tables, tape diagrams, double number lines) to make sense of grade level work.

Follow Up Observational Data



Teacher: Mr. Tarpley

Grade-Level: 8th

Observation: Tier 2

Key Levers Impact Area: Assessment & Differentiation

Tool: Key Levers

During Tier 2 instruction, what might you hear and see during a walk-through?

Hear	See
Teacher asks purposeful questions in small group or individually.	Students working independently and in groups using key predecessor skills.
Student to student and student to teacher discourse connecting key predecessor skills to grade level concepts they are learning in Tier 1.	Teachers conducting small group instruction with lessons from HQIM.
Teacher connects key processors to Tier 1 instruction using metacognitive strategies such as think alouds.	A data collection system in place to monitor student progress.
Students ask clarifying questions to connect Tier 1 and Tier 2 concepts.	Teachers use frequent checks for understanding of key predecessors.

Coherence = HQIM & Key Predecessors

What if we took a Tier 1 and Tier 2 approach?

	Planning	Implementation	Assessing
Tier 1 =	Apply Lesson Internalization In Collaborative Teams	Use district-adopted HQIM	Select HQIM Assessment
+			
Tier 2 =	Identify key predecessors & administer diagnostic	Conduct small groups and personalize pathways	Complete test by skills
	-----	-----	-----
Data =	Lesson internalization w/annotations	Key Levers Tool walkthrough data	Student work- assessment
	Analysis diagnostic data for grouping	Student completing skill per week/month	Student work- Skill scores

SYSTEM REFLECTION



Algebra I Readiness Checklist



Review current school/district. Check each item based on system-wide evidence. Base your responses strictly on evidence, not assumptions. If an item cannot be checked, note it as an opportunity for deeper analysis or adjustment.

Ensure Tier 1 and Tier 2 Work Together

☐	1. Tier 1 (whole group) instruction sets a high standard for all students.
☐	2. Teachers and intervention specialists have timely diagnostic data and an easy way to identify key predecessors.
☐	3. Tier 2 responds to each student's readiness and equip student to engage with the current lesson.
☐	4. Tier 2 instruction is tailored to help each student acquire new skills based on their prior knowledge.
☐	5. Students know exactly what to expect and have a clear pathway to success.
☐	6. Students and families understand the skills needed for Algebra I readiness.

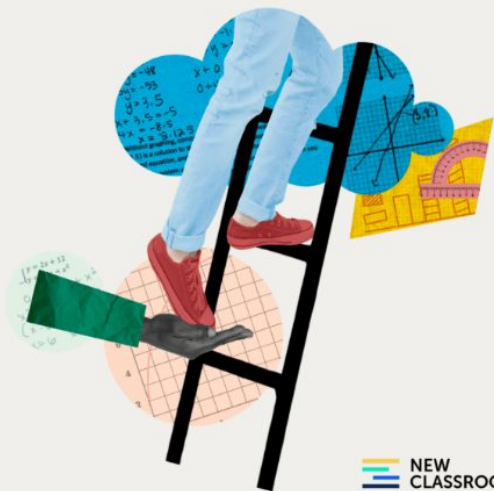


Research Resources



Unlocking Algebra

What the Data Tells Us About Helping Students Catch Up



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Recommendations for School Systems:

Adopt Rigorous Tier 2 Solutions and Provide Supports for Teachers

School systems often use digital learning products as one part of their Tier 2 strategy. But many popular platforms take a start-at-the-bottom approach, providing practice that is too easy or unrelated to the lesson at hand. Some take a grade-level-only approach that aligns to Tier 1 instruction but does little to address unfinished learning on key predecessor concepts and skills. Others may focus on a common set of predecessors for all students, rather than taking an individualized approach that meets each student where they are and provides them with a path to proficiency. When purchasing a Tier 2 solution, it's important for system leaders to understand how the platform diagnoses student readiness and recommends practice tasks. In addition, school systems should consider future research that examines how we can sustain these recommendations in practice.

Key questions for school system leaders to consider:

1. How does the Tier 2 platform integrate with Tier 1 instruction?
2. Does the Tier 2 platform provide teachers with precise diagnostics to identify the most relevant unfinished learning for each student? Can teachers easily assign modules that address their students' unique sets of key predecessor gaps and that relate to Tier 1 instruction?
3. How is high-quality content on predecessor skills used, including content from prior years? How far back can students go in order to address key predecessors?
4. Is there a clear and transparent pathway to proficiency for each student, informed by key predecessors, and real-time progress on that individualized pathway?
5. What supports and/or resources must be in place for Algebra teachers to ensure their students receive Tier 2 instruction when needed? How can there be improved coordination between teachers and their roles in supporting students?



<https://bit.ly/4oAQucW>

Key Predecessors

Algebra I Concept and Skill	Key Predecessor	Grade Level of Key Predecessor
Add & Multiply Rational & Irrational Numbers	Rational & Irrational Numbers	8
Add & Multiply Rational & Irrational Numbers	Simplify Radicals	9
Add & Multiply Rational & Irrational Numbers	Estimate Square Roots	8
Add & Subtract Polynomials	Add & Subtract Linear Expressions	7
Add & Subtract Polynomials	Polynomials in Standard Form	9
Add, Subtract, Multiply, & Divide Radicals	Add & Subtract Linear Expressions	7
Add, Subtract, Multiply, & Divide Radicals	Simplify Radicals	9
Add, Subtract, Multiply, & Divide Radicals	Estimate Square Roots	8
Arithmetic Sequences	Function Rules	8
Arithmetic Sequences	Function Notation	9
Arithmetic Sequences	Define Functions	8
Average Rate of Change	Construct Functions	8
Average Rate of Change	Slope Given 2 Points	8
Compare Functions	Piecewise Functions	9
Compare Functions	Average Rate of Change	9
Complete the Square	Parabola Key Values from Graphs	9
Complete the Square	Solve Quadratics by Factoring	9
Complete the Square	Simplify Radicals	9
Compound Interest	Function Notation	9
Correlation Coefficient	Construct Functions	8
Correlation vs. Causation	Lines of Best Fit	8

Q & A

Thank you for attending!

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